

ABSTRACT

In countries that fight malnutrition and hunger, governments and international agencies sponsor welfare programs to improve consumption of staple food among the poor. Although the donors in such programs provide product subsidy to make it affordable and accessible, the supply chain used to deliver these products to the end beneficiary is prone to losses/diversion. Intervention of advanced technologies like RFID, GPS, and GIS is likely to improve the efficiency/effectiveness of such systems. However, adoption of these technologies in public distribution system is not proliferating due to various issues. One of the prime reason of the non-adoption is the fear of high cost associated with its implementation. Due to lack of benefit quantification model in the not-for-profit context, there exists a credibility gap between the perceived benefit and actual benefit arising out of these technology implementation. Further, in a welfare program like food security there are various stakeholders involved, and at times they have conflicting objectives. So it is essential to analyze how advanced technology adoption like RFID impacts the donors, program implementing agencies and the beneficiaries in terms of subsidy, overall cost and product availability. In this regard, three analytical models under newsvendor framework are presented in the thesis to study the implications. The first model explores the possibility of deploying RFID technology in a warehouse operating under not-for-profit scenario to address inventory inaccuracy issues. The model quantifies the value of RFID by comparing expected cost under two scenarios-with and without RFID. The generic expressions are further analyzed under uniformly distributed demand to derive the closed-form solution of *critical tag cost* below which RFID deployment is viable. The second model considers a donor funded supply chain scenario. It characterizes the implementing agency as a for-profit/ not-for-profit firm and compares donor subsidy with/without RFID under target consumption level. The third model investigates the impact of RFID on expected consumption considering fixed budget and price dependent demand. The solution procedure is explained to derive expressions for order quantity and expected consumptions under price-taking and price-setting conditions. All the above models are applied to the Indian Public Distribution System for numerical analysis and managerial insights

Keywords: RFID, Food Security, PDS, Inventory inaccuracy, Long-term humanitarian supply chain, Subsidy, Newsvendor model